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RAPID PROTOTYPING

BENDING LIMITATIONS

CONCEPT 3D printing, a common approach to rapid prototyping, has many strengths which are also its weaknesses/limitations.

It is not suitable for producing food-grade parts or parts that meet fire-proofing standards. Its transparency is lower than that of machined parts, and its mechanical properties, like impact strength and bending, are not similar to manufactured parts. This is in part due to the internal structure of 3D printed parts and the materials used.

Bending is a common process used in rapid prototyping to measure flexibility and strength. One of its limitations is that it can be difficult to achieve precise angles and curves with bending. Another limitation is that bending can cause warping or distortion of the material being bent. Bending also may not be suitable for all types of materials or geometries.

BACKGROUND

Significant advancements were made in the 1900s in material science, particularly in the development of new alloys and polymers. In the 1920s, aluminum alloys were introduced and offered improved strength and flexibility. In the 1950s, the development of nylon and other synthetic fibers provided materials with unprecedented flexibility and durability. In recent years, advances in nanotechnology and other areas of material science have continued to push the boundaries of what is possible, with new materials being developed that offer even greater bend, flexibility and resilience.

Make sure it measures up

REAL WORLD CONNECTIONS

Smartphone screens are typically made from glass, which is known for its brittleness and susceptibility to cracking under stress. To improve the flexibility of smartphone screens, manufacturers have turned to materials like Corning's Gorilla Glass, which is chemically strengthened to improve its durability and reduce the likelihood of cracking. However, even with these improvements, smartphone screens still have limitations when it comes to bending and flexibility. This is why many smartphones now incorporate flexible OLED (organic light-emitting diode) displays, which use flexible materials like plastic instead of glass to allow for greater bending and flexibility. Even with these advancements, there are still limits to how much a smartphone screen can bend or flex without breaking, and manufacturers must carefully balance flexibility with durability and functionality to provide a high-quality user experience.

EXAMPLES

Bending can cause warping or distortion of the material being bent. This can be due to the limitations of the bending process itself or the limitations of the material being used.

Bending may not be suitable for all types of materials or geometries. It is important to consider the properties of the material being used and the geometry of the part being produced when deciding whether to use bending in rapid prototyping.

Rapid prototyping can produce parts that are not 100% accurate or representative of the final product. This means engineers cannot always rely on rapid prototype parts test results when evaluating a design.

Rapid prototyping technologies are typically limited to a small number of materials, such as plastics and resins, which are often brittle and incapable of bending.

Rapid prototyping can have lower accuracy and precision compared to traditional manufacturing methods. In addition, the internal lattice structure common in 3D printing creates extra geometry that may not bend as intended.